Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

Amendments to the Claims:

1 – 168. (canceled)

169. (new)   A computer system comprising:

5   a host entity for issuing IO requests;

         a redundant external storage virtualization controller (SVC) pair for performing IO operations in response to IO requests issued by the host entity comprising a first and a second external storage virtualization controller coupled to the host entity; and

10   a set of at least one physical storage device for providing storage to the computer system, with at least one member of said set of at least one physical storage device comprising a PSD coupled to the said redundant storage virtualization controller pair through a point-to-point serial signal interconnect;

         wherein when one storage virtualization controller in the said redundant SVC pair is

15   not on line or goes off line after being on line, the alternate storage virtualization controller in the said redundant SVC pair will automatically take over the functionality originally performed by the said one storage virtualization controller in the redundant SVC pair; and

         wherein in the redundant storage virtualization controller pair, each of the storage

20   virtualization controllers further comprises:

         a central processing circuitry for performing IO operations in response to IO requests of said host entity;

         at least one IO device interconnect controller coupled to said central processing circuitry;

25   at least one host-side IO device interconnect port provided in a said at least one IO device interconnect controller for coupling to said host entity; and

         at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller coupled to said at least one physical storage device

—   2

through a point-to-point serial-signal interconnect.

170. (new) The redundant storage virtualization computer system of claim 169 wherein
said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.

5

171. (new)   The storage virtualization computer system of one of claims 169 and 170
wherein a said host-side IO device interconnect port and a said device-side IO device
interconnect port are provided in the same said IO device interconnect controller.

10   172. (new)   The storage virtualization computer system of one of claims 169 and 170
wherein a said host-side IO device interconnect port and a said device-side IO device
interconnect port are provided in different said IO device interconnect controllers.

173. (new) A redundant storage virtualization subsystem for providing storage to a host
15   entity, comprising:
a redundant external storage virtualization controller (SVC) pair for performing IO
operations in response to IO requests issued by the host entity comprising a first
and a second storage virtualization controller for coupling to the host entity; and
a set of at least one physical storage device for providing storage to the host entity,
20   with at least one member of said set of at least one physical storage device
comprising a PSD coupled to the said redundant storage virtualization controller
pair through a point-to-point serial signal interconnect;
wherein when one storage virtualization controller in the said redundant SVC pair is
not on line or goes off line after being on line, the alternate storage virtualization
25   controller in the said redundant SVC pair will automatically take over the
functionality originally performed by the said one storage virtualization controller
in the redundant SVC pair;
wherein for each of at least one of the said physical storage devices, the redundant

3

storage virtualization subsystem further comprises an access control switch coupled between said physical storage device and the redundant storage virtualization controller pair for selectively switching the connection of the said physical storage device to the redundant SVC pair between the first and the

5   second storage virtualization controller; and

wherein at least one said PSD together with said access control switch is installed in a canister removably attached to the redundant storage virtualization subsystem.

174. (new)   The redundant storage virtualization subsystem of claim 173 wherein the
10   said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.

175. (new)   A redundant storage virtualization subsystem for providing storage to a host entity, comprising:

a redundant external storage virtualization controller (SVC) pair for performing IO
15   operations in response to IO requests issued by the host entity comprising a first and a second storage virtualization controller for coupling to the host entity; and

a set of at least one physical storage device for providing storage to the host entity, with at least one member of said set of at least one physical storage device comprising a PSD coupled to the said redundant storage virtualization controller
20   pair through a point-to-point serial signal interconnect;

wherein when one storage virtualization controller in the said redundant SVC pair is not on line or goes off line after being on line, the alternate storage virtualization controller in the said redundant SVC pair will automatically take over the functionality originally performed by the said one storage virtualization controller
25   in the redundant SVC pair;

wherein for each of at least one of the said physical storage devices, the redundant storage virtualization subsystem further comprises an access control switch coupled between said physical storage device and the redundant storage

4

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

virtualization controller pair for selectively switching the connection of the said physical storage device to the redundant SVC pair between the first and the second storage virtualization controller; and

wherein said access control switch coupled between a said physical storage device

5   and the redundant storage virtualization controller pair selectively allows patching through of the serial signal of the said   physical storage device to and from the first SVC when in a first patching state of said access control switch and to and from the second SVC when in a second patching state of said access control switch.

10

176. (new)   The redundant storage virtualization subsystem of claim 175 wherein the said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.

15   177. (new) The redundant storage virtualization subsystem of one of claims 175 and 176, wherein an access ownership arbitration mechanism is provided between said SVC pair and said access control switch to control the patching state of said access control switch.

20   178. (new) The redundant storage virtualization subsystem of claim 177, wherein said access ownership arbitration mechanism comprises a pair of access request signal lines coupled between said SVC pair; said first SVC being active on a first of said access request signal line pair and passive on a second of said access request signal line pair; said second SVC being active on said second and passive on said

25   first of said access request signal line pair; and said SVC pair each being capable of issuing an access request signal on its own said-active access request signal line, and reading a requesting state on   its own said passive access request signal line and identifying a change of said requesting state since previous reading on its

5

own said passive access request signal line.

179. (new) The redundant storage virtualization subsystem of claim 177, wherein said access ownership arbitration mechanism includes an access ownership detecting
5   mechanism to determine if access ownership is possessed by a said SVC.

180. (new) The redundant storage virtualization subsystem of claim 177, wherein said access ownership arbitration mechanism includes an access ownership granting mechanism to grant access ownership when said access ownership is requested
10   by a said SVC.

181. (new) The redundant storage virtualization subsystem of claim 177, wherein said access ownership arbitration mechanism comprises an access ownership arbitration circuit (AOAC) coupled to said first and second SVCs and said access
15   control switch, and wherein if said first SVC issues a first access ownership request signal received by said AOAC, access ownership will be granted to said first SVC when said second SVC does not already possess the access ownership, and if said second SVC issues a second access ownership request signal received by said AOAC, access ownership will be granted to said second SVC when said
20   first SVC does not already possess the access ownership.

182. (new) The redundant storage virtualization subsystem of claim 181, further comprises an access ownership determining mechanism whereby when said first and said second SVC concurrently issue said first and second access ownership
25   request signals to said AOAC, access ownership will be granted to a predetermined one of said SVC pair.

183. (new) A redundant storage virtualization subsystem for providing storage to a host

6

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

entity, comprising:

a redundant external storage virtualization controller (SVC) pair for performing IO operations in response to IO requests issued by the host entity comprising a first and a second storage virtualization controller for coupling to the host entity; and

5   a set of at least one physical storage device for providing storage to the host entity, with at least one member of said set of at least one physical storage device comprising a PSD coupled to the said redundant storage virtualization controller pair through a point-to-point serial signal interconnect;

wherein when one storage virtualization controller in the said redundant SVC pair is

10   not on line or goes off line after being on line, the alternate storage virtualization controller in the said redundant SVC pair will automatically take over the functionality originally performed by the said one storage virtualization controller in the redundant SVC pair;

wherein for each of at least one of the said physical storage devices, the redundant

15   storage virtualization subsystem further comprises an access control switch coupled between said physical storage device and the redundant storage virtualization controller pair for selectively switching the connection of the said physical storage device to the redundant SVC pair between the first and the second storage virtualization controller; and

20   further comprising a cooperating mechanism for the redundant SVC pair to cooperatively control a patching state of said access control switch; a monitoring mechanism for each SVC of said SVC pair to monitor status of the other SVC of said SVC pair; and, a state control mechanism for each SVC of said SVC pair to forcibly take complete control of said access control switch independent of the

25   state the other SVC of said SVC pair.

184. (new)   The redundant storage virtualization subsystem of claim 183 wherein the said point-to-point serial signal interconnect is a Serial ATA IO device

7

interconnect.

185. (new)   A redundant storage virtualization subsystem for providing storage to a
host entity, comprising:

5   a redundant external storage virtualization controller (SVC) pair for performing IO
         operations in response to IO requests issued by the host entity comprising a first
         and a second storage virtualization controller for coupling to the host entity; and
         a set of at least one physical storage device for providing storage to the host entity,
         with at least one member of said set of at least one physical storage device
10   comprising a PSD coupled to the said redundant storage virtualization controller
         pair through a point-to-point serial signal interconnect;
         wherein when one storage virtualization controller in the said redundant SVC pair is
         not on line or goes off line after being on line, the alternate storage virtualization
         controller in the said redundant SVC pair will automatically take over the
15   functionality originally performed by the said one storage virtualization controller
         in the redundant SVC pair; and
         wherein in the redundant storage virtualization controller pair, each of the storage
         virtualization controllers further comprises:
         a central processing circuitry for performing IO operations in response to IO
20   requests of said host entity;
         at least one IO device interconnect controller coupled to said central processing
              circuitry;
         at least one host-side IO device interconnect port provided in a said at least one IO
              device interconnect controller for coupling to said host entity; and
25   at least one device-side IO device interconnect port provided in a said at least one
              IO device interconnect controller coupled to at least one physical storage
              device through a point-to-point serial-signal interconnect.

8

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

186. (new)   The redundant storage virtualization subsystem of claim 185 wherein the said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.

187. (new)   The redundant storage virtualization subsystem of one of claims 185 and
5   186 wherein a said host-side IO device interconnect port and a said device-side IO device interconnect port are provided in the same said IO device interconnect controller.

188. (new)   The redundant storage virtualization subsystem of one of claims 185 and
10   186 wherein a said host-side IO device interconnect port and a said device-side IO device interconnect port are provided in different said IO device interconnect controllers.

189. (new) The redundant storage virtualization subsystem of one of claims 185 and 186,
15   wherein a logical media unit that is presented to said host entity through a first said host-side IO device interconnect port is also redundantly presented through a second said host-side IO device interconnect port.

190. (new) The redundant storage virtualization subsystem of claim 189, wherein the first
20   said host-side IO device interconnect port and the second said host-side IO device interconnect port are IO device interconnect ports of the same one SVC in the redundant SVC pair.

191. (new) The redundant storage virtualization subsystem of claim 189, wherein the first
25   said host-side IO device interconnect port is an IO device interconnect port of one SVC in the redundant SVC pair and the second said host-side IO device interconnect port is an IO device interconnect port of the other SVC in the redundant SVC pair.

9

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

192. (new) The redundant storage virtualization subsystem of claim 189, wherein the first said host-side IO device interconnect port and the second said host-side IO device interconnect port are coupled to the same host-side IO device interconnect.

5   193. (new) The redundant storage virtualization subsystem of claim 192, wherein the first said host-side IO device interconnect port and the second said host-side IO device interconnect port are coupled to the said same host-side IO device interconnect through a switch circuit.

10   194. (new) The redundant storage virtualization subsystem of claim 189, wherein the first said host-side IO device interconnect port and the second said host-side IO device interconnect port are each coupled to a different host-side IO device interconnect.

195. (new) The redundant storage virtualization subsystem of one of claims 185 and 186,
15   wherein at least one said host-side IO device interconnect port is Fibre Channel supporting point-to-point connectivity in target mode.

196. (new) The redundant storage virtualization subsystem of one of claims 185 and 186, wherein at least one said host-side IO device interconnect port is Fibre Channel
20   supporting public loop connectivity in target mode.

197. (new) The redundant storage virtualization subsystem of one of claims 185 and 186, wherein at least one said host-side IO device interconnect port is Fibre Channel supporting private loop connectivity in target mode.

25
198. (new) The redundant storage virtualization subsystem of one of claims 185 and 186, wherein at least one said host-side IO device interconnect port is parallel SCSI operating in target mode.

10

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

199. (new) The redundant storage virtualization subsystem of one of claims 185 and 186, wherein at least one said host-side IO device interconnect port is ethernet supporting the iSCSI protocol operating in target mode.

5

200. (new) The redundant storage virtualization subsystem of one of claims 185 and 186, wherein at least one said host-side IO device interconnect port is Serial-Attached SCSI (SAS) operating in target mode.

10   201. (new) The redundant storage virtualization subsystem of one of claims 185 and 186, wherein at least one said host-side IO device interconnect port is Serial ATA operating in target mode.

202. (new) A redundant storage virtualization subsystem for providing storage to a host
15   entity, comprising:
           a redundant external storage virtualization controller (SVC) pair for performing IO
               operations in response to IO requests issued by the host entity comprising a first
               and a second storage virtualization controller for coupling to the host entity; and
           a set of at least one physical storage device for providing storage to the host entity,
20   with at least one member of said set of at least one physical storage device
               comprising a PSD coupled to the said redundant storage virtualization controller
               pair through a point-to-point serial signal interconnect;
           wherein when one storage virtualization controller in the said redundant SVC pair is
               not on line or goes off line after being on line, the alternate storage virtualization
25   controller in the said redundant SVC pair will automatically take over the
               functionality originally performed by the said one storage virtualization controller
               in the redundant SVC pair; and
           wherein an inter-controller communication channel is provided between the two

11

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

SVCs in said redundant SVC pair for communicating state synchronization information.

203. (new)　　The redundant storage virtualization subsystem of claim 202 wherein the
5　　　　said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.

204. (new) The redundant storage virtualization subsystem of one of claims 202 and 203,
wherein said inter-controller communication channel is an existing IO device interconnect, whereby inter-controller communication exchange is multiplexed
10　　　　with IO requests and associated data.

205. (new) The redundant storage virtualization subsystem of one of claims 202 and 203,
wherein said inter-controller communication channel is a dedicated channel the primary function thereof is to exchange said state synchronization information.

15

206. (new) The redundant storage virtualization subsystem of one of claims 202 and 203,
wherein said inter-controller communication channel is Fibre Channel.

207. (new) The redundant storage virtualization subsystem of one of claims 202 and 203,
20　　　　wherein said inter-controller communication channel is Serial ATA.

208. (new) The redundant storage virtualization subsystem of one of claims 202 and 203,
wherein said inter-controller communication channel is Parallel SCSI.

25　　209. (new) The redundant storage virtualization subsystem of one of claims 202 and 203,
　　　　wherein said inter-controller communication channel is Ethernet.

210. (new) The redundant storage virtualization subsystem of one of claims 202 and 203,

12

wherein said inter-controller communication channel is Serial-Attached SCSI (SAS).

211. (new) The redundant storage virtualization subsystem of one of claims 202 and 203,
5   wherein said inter-controller communication channel is I2C.

212. (new) A redundant storage virtualization subsystem for providing storage to a host
          entity, comprising:
          a redundant external storage virtualization controller (SVC) pair for performing IO
10   operations in response to IO requests issued by the host entity comprising a first
               and a second storage virtualization controller for coupling to the host entity; and
          a set of at least one physical storage device for providing storage to the host entity,
               with at least one member of said set of at least one physical storage device
               comprising a PSD coupled to the said redundant storage virtualization controller
15   pair through a point-to-point serial signal interconnect;
          wherein when one storage virtualization controller in the said redundant SVC pair is
               not on line or goes off line after being on line, the alternate storage virtualization
               controller in the said redundant SVC pair will automatically take over the
               functionality originally performed by the said one storage virtualization controller
20   in the redundant SVC pair; and
          wherein said redundant SVC pair can perform IO request rerouting function.

213. (new)   The redundant storage virtualization subsystem of claim 212 wherein the
          said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.
25

214. (new) A redundant storage virtualization subsystem for providing storage to a host
          entity, comprising:
          a redundant external storage virtualization controller (SVC) pair for performing IO

13

operations in response to IO requests issued by the host entity comprising a first
and a second storage virtualization controller for coupling to the host entity; and

a set of at least one physical storage device for providing storage to the host entity,
with at least one member of said set of at least one physical storage device

5   comprising a PSD coupled to the said redundant storage virtualization controller
pair through a point-to-point serial signal interconnect;

wherein when one storage virtualization controller in the said redundant SVC pair is
not on line or goes off line after being on line, the alternate storage virtualization
controller in the said redundant SVC pair will automatically take over the

10   functionality originally performed by the said one storage virtualization controller
in the redundant SVC pair; and

wherein said redundant SVC pair can perform PSD access ownership transfer
function.

15   215. (new)   The redundant storage virtualization subsystem of claim 214 wherein the
said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.

216. (new) A redundant storage virtualization subsystem for providing storage to a host
entity, comprising:

20   a redundant external storage virtualization controller (SVC) pair for performing IO
operations in response to IO requests issued by the host entity comprising a first
and a second storage virtualization controller for coupling to the host entity; and

a set of at least one physical storage device for providing storage to the host entity,
with at least one member of said set of at least one physical storage device

25   comprising a PSD coupled to the said redundant storage virtualization controller
pair through a point-to-point serial signal interconnect;

wherein when one storage virtualization controller in the said redundant SVC pair is
not on line or goes off line after being on line, the alternate storage virtualization

14

controller in the said redundant SVC pair will automatically take over the functionality originally performed by the said one storage virtualization controller in the redundant SVC pair; and

wherein at least one member SVC of said redundant SVC pair includes at least one

5   expansion port for coupling to a second set of at least one PSD through a multiple-device device-side IO device interconnect.

217. (new)   The redundant storage virtualization subsystem of claim 216 wherein the said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.

10

218. (new) The redundant storage virtualization subsystem of one of claims 216 and 217, wherein members of a set of at least one said expansion port are mutually coupled together and to the said second set of at least one PSD through a switch circuit.

15   219. (new) The redundant storage virtualization subsystem of one of claims 216 and 217, wherein members of a set of at least one said expansion port are mutually coupled together and to the said second set of at least one PSD directly without intervening circuitry.

20   220. (new) The redundant storage virtualization subsystem of one of claims 216 and 217, wherein a set of at least two said expansion ports form a redundant expansion port set for mutually performing IO request rerouting function whereby IO requests normally delivered to a PSD through a first member port of said redundant expansion port set may be rerouted through a second member port of said redundant

25   expansion port set.

221. (new) The redundant storage virtualization subsystem of one of claims 216 and 217, wherein a member of said second set of at least one PSD has a pair of redundant

15

ports with a member port of said redundant port pair being coupled to a set of at least one said expansion port.

5   222. (new) The redundant storage virtualization subsystem of claim 221, wherein IO request rerouting function can be performed through said redundant ports of said member of said second set of at least one PSD whereby IO requests normally delivered to a PSD through a first member port of said redundant port pair may be rerouted to said PSD through a second member port of said redundant port pair.

10   223. (new) The redundant storage virtualization subsystem of claim 222, wherein a set of at least two said expansion ports form a redundant expansion port set for mutually performing IO request rerouting function whereby IO requests normally delivered to a PSD through a first member port of said redundant expansion port set may be rerouted through a second member port of said redundant expansion port set.

15

224. (new) The redundant storage virtualization subsystem of claim 221, wherein each member port in the said PSD redundant port pair is coupled to a different set of at least one expansion port.

20   225. (new) The redundant storage virtualization subsystem of claim 221, wherein said member port of redundant PSD port pair and said set of at least one said expansion port are mutually coupled together through a switch circuit.

226. (new) The redundant storage virtualization subsystem of claim 225, wherein said set
25   of at least one expansion port comprises a first and a second expansion port subset forming a pair of complementary subsets with at least one member expansion port per subset.

16

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

227. (new) The redundant storage virtualization subsystem of claim 226, wherein one of
    the interconnect signal line switching mechanisms implemented by said switch
    circuit is the coupling of said first subset of the said complementary subset pair to a
    first member port of said PSD redundant port pair and coupling of said second
5   subset of the said complementary subset pair to a second member port of said PSD
    redundant port pair.

228. (new) The redundant storage virtualization subsystem of claim 226, wherein one of
    the interconnect signal line switching mechanisms implemented by said switch
10 circuit is the coupling of both subsets of the said complementary subset pair to a
    first member port of said PSD redundant port pair.

229. (new) The redundant storage virtualization subsystem of claim 226, wherein one of
    the interconnect signal line switching mechanisms implemented by said switch
15 circuit is the coupling of said first subset of the said complementary subset pair to a
    first member port of said PSD redundant port pair.

230. (new) The redundant storage virtualization subsystem of claim 226, wherein said
    switch circuit implements an interconnect signal line switching mechanism that
20 supports all of the following arrangements:
    (1) coupling of said first subset of the said complementary subset pair to a first
        member port of said PSD redundant port pair and coupling of said second subset
        of the said complementary subset pair to a second member port of said PSD
        redundant port pair;
25 (2) coupling of both subsets of the said complementary subset pair to said first
        member port of said PSD redundant port pair;
    (3) coupling of both subsets of the said complementary subset pair to said second
        member port of said PSD redundant port pair;

17

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

(4) coupling of said first subset of the said complementary subset pair to said first member port of said PSD redundant port pair;

(5) coupling of said second subset of the said complementary subset pair to said second member port of said PSD redundant port pair;

5   (6) coupling of said second subset of the said complementary subset pair to said first member port of said PSD redundant port pair; and,

(7) coupling of said first subset of the said complementary subset pair to said second member port of said PSD redundant port pair.

10 231. (new) The redundant storage virtualization subsystem of claim 221, wherein said member port of redundant PSD port pair and said set of at least one said expansion port are directly coupled together without intervening circuitry.

232. (new) The redundant storage virtualization subsystem of claim 221, wherein a
15   member SVC of the redundant SVC pair further comprises at least two said expansion ports forming a redundant expansion port set.

233. (new) The redundant storage virtualization subsystem of claim 232, wherein a first and a second member port in the said redundant expansion port set are each
20   coupled to a different one of member ports in redundant PSD port pair of a member PSD of said second set of at least one PSD.

234. (new) The redundant storage virtualization subsystem of claim 232, wherein a first and a second member port in the said redundant expansion port set are both coupled
25   to the same one of member ports in redundant PSD port pair of a member PSD of said second set of at least one PSD.

235. (new) The redundant storage virtualization subsystem of claim 234, wherein said

18

first and said second member port are directly connected to the same one of
member ports in redundant PSD port pair of a member of said second set of at least
one PSD without intervening circuitry.

5   236. (new) The redundant storage virtualization subsystem of claim 221 comprising:
        a first expansion port set comprising at least one said expansion port on the first
            SVC in the redundant SVC pair;
        a second expansion port set comprising at least one said expansion port on the
            second SVC in the redundant SVC pair;
10   wherein said first expansion port set and said second expansion port set together
            form a redundant expansion port set pair.

    237. (new) The redundant storage virtualization subsystem of claim 236 wherein said first
        expansion port set and said second expansion port set are each coupled to a
15   different one of member ports in redundant PSD port pair of each PSD of said
        second set of at least one PSD.

    238. (new) The redundant storage virtualization subsystem of claim 236, wherein said
        first expansion port set and said second expansion port set are both coupled to the
20   same one of member ports in redundant PSD port pair of each PSD of said second
        set of at least one PSD.

    239. (new) The redundant storage virtualization subsystem of one of claims 216 and 217,
        wherein at least one said expansion port is Fibre Channel.
25
    240. (new) The redundant storage virtualization subsystem of one of claims 216 and 217,
        wherein at least one said expansion port is Parallel SCSI.

19

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

241. (new) The redundant storage virtualization subsystem of one of claims 216 and 217, wherein at least one said expansion port is Serial ATA.

242. (new) The redundant storage virtualization subsystem of one of claims 216 and 217,
5   wherein at least one said expansion port is Ethernet.

243. (new) The redundant storage virtualization subsystem of one of claims 216 and 217, wherein at least one said expansion port is Serial-Attached SCSI (SAS).

10   244. (new) A redundant storage virtualization subsystem for providing storage to a host entity, comprising:
        a redundant external storage virtualization controller (SVC) pair for performing IO operations in response to IO requests issued by the host entity comprising a first and a second storage virtualization controller for coupling to the host entity; and
15   a set of at least one physical storage device for providing storage to the host entity, with at least one member of said set of at least one physical storage device comprising a PSD coupled to the said redundant storage virtualization controller pair through a point-to-point serial signal interconnect;
        wherein when one storage virtualization controller in the said redundant SVC pair is
20   not on line or goes off line after being on line, the alternate storage virtualization controller in the said redundant SVC pair will automatically take over the functionality originally performed by the said one storage virtualization controller in the redundant SVC pair; and
        wherein said PSD is a SATA PSD.
25
    245. (new)   The redundant storage virtualization subsystem of claim 244 wherein the said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.

20

246. (new) A redundant storage virtualization subsystem for providing storage to a host entity, comprising:

    a redundant external storage virtualization controller (SVC) pair for performing IO operations in response to IO requests issued by the host entity comprising a first

5   and a second storage virtualization controller for coupling to the host entity; and

    a set of at least one physical storage device for providing storage to the host entity, with at least one member of said set of at least one physical storage device comprising a PSD coupled to the said redundant storage virtualization controller pair through a point-to-point serial signal interconnect;

10   wherein when one storage virtualization controller in the said redundant SVC pair is not on line or goes off line after being on line, the alternate storage virtualization controller in the said redundant SVC pair will automatically take over the functionality originally performed by the said one storage virtualization controller in the redundant SVC pair; and

15   wherein said PSD is a PATA PSD.

247. (new)   The redundant storage virtualization subsystem of claim 246 wherein the said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.

20 248. (new) A redundant storage virtualization subsystem for providing storage to a host entity, comprising:

    a redundant external storage virtualization controller (SVC) pair for performing IO operations in response to IO requests issued by the host entity comprising a first and a second storage virtualization controller for coupling to the host entity; and

25   a set of at least one physical storage device for providing storage to the host entity, with at least one member of said set of at least one physical storage device comprising a PSD coupled to the said redundant storage virtualization controller pair through a point-to-point serial signal interconnect;

21

wherein when one storage virtualization controller in the said redundant SVC pair is not on line or goes off line after being on line, the alternate storage virtualization controller in the said redundant SVC pair will automatically take over the functionality originally performed by the said one storage virtualization controller

5   in the redundant SVC pair; and

wherein each SVC in said redundant SVC pair includes a state-defining circuit for forcing externally connected signal lines of alternate SVC in said redundant SVC pair to a predetermined state.

10   249. (new)   The redundant storage virtualization subsystem of claim 248 wherein the said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.

250. (new) A redundant storage virtualization subsystem for providing storage to a host entity, comprising:

15   a redundant external storage virtualization controller (SVC) pair for performing IO operations in response to IO requests issued by the host entity comprising a first and a second storage virtualization controller for coupling to the host entity; and

a set of at least one physical storage device for providing storage to the host entity, with at least one member of said set of at least one physical storage device

20   comprising a PSD coupled to the said redundant storage virtualization controller pair through a point-to-point serial signal interconnect;

wherein when one storage virtualization controller in the said redundant SVC pair is not on line or goes off line after being on line, the alternate storage virtualization controller in the said redundant SVC pair will automatically take over the

25   functionality originally performed by the said one storage virtualization controller in the redundant SVC pair; and

wherein each SVC of said redundant SVC pair includes a self-killing circuit for forcing its own externally connected signal lines to a predetermined state.

22

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

251. (new)   The redundant storage virtualization subsystem of claim 250 wherein the
said point-to-point serial signal interconnect is a Serial ATA IO device interconnect.

5   252. (new)   An external storage virtualization controller for use in a redundant storage
virtualization controller pair, comprising:
a central processing circuitry for performing IO operations in response to IO
requests of a host entity;
at least one IO device interconnect controller coupled to said central processing
10   circuitry;
at least one host-side IO device interconnect port provided in a said at least one IO
device interconnect controller for coupling to said host entity; and
at least one device-side IO device interconnect port provided in a said at least one
IO device interconnect controller for performing point-to-point serial signal
15   transmission with at least one physical storage devices;
wherein the said external storage virtualization controller will automatically take
over the functionality originally performed by the alternate external storage
virtualization controller in the said redundant storage virtualization controller pair
when said alternate external storage virtualization controller is not on line or goes
20   off line after being on line; and
wherein a said host-side IO device interconnect port and a said device-side IO
device interconnect port are provided in the same said IO device interconnect
controller.

25   253. (new) An external storage virtualization controller for use in a redundant storage
virtualization controller pair, comprising:
a central processing circuitry for performing IO operations in response to IO
requests of a host entity;

23

at least one IO device interconnect controller coupled to said central processing circuitry;

at least one host-side IO device interconnect port provided in a said at least one IO device interconnect controller for coupling to said host entity; and

5   at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller for performing point-to-point serial signal transmission with at least one physical storage devices;

wherein the said external storage virtualization controller will automatically take over the functionality originally performed by the alternate external storage

10   virtualization controller in the said redundant storage virtualization controller pair when said alternate external storage virtualization controller is not on line or goes off line after being on line; and

wherein a said host-side IO device interconnect port and a said device-side IO device interconnect port are provided in different said IO device interconnect

15   controllers.

254. (new) An external storage virtualization controller for use in a redundant storage virtualization controller pair, comprising:

a central processing circuitry for performing IO operations in response to IO

20   requests of a host entity;

at least one IO device interconnect controller coupled to said central processing circuitry;

at least one host-side IO device interconnect port provided in a said at least one IO device interconnect controller for coupling to said host entity; and

25   at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller for performing point-to-point serial signal transmission with at least one physical storage devices;

wherein the said external storage virtualization controller will automatically take

24

over the functionality originally performed by the alternate external storage virtualization controller in the said redundant storage virtualization controller pair when said alternate external storage virtualization controller is not on line or goes off line after being on line; and

5   further comprising a detection mechanism for detecting an off-line or failed state of said alternate storage virtualization controller.

255. (new)   The storage virtualization controller of claim 254 wherein the a said at least one device-side IO device interconnect port comprises a Serial ATA

10   interconnect port for connecting to a said physical storage device through a Serial ATA IO device interconnect.

256. (new) An external storage virtualization controller for use in a redundant storage virtualization controller pair, comprising:

15   a central processing circuitry for performing IO operations in response to IO requests of a host entity;

at least one IO device interconnect controller coupled to said central processing circuitry;

at least one host-side IO device interconnect port provided in a said at least one IO

20   device interconnect controller for coupling to said host entity; and

at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller for performing point-to-point serial signal transmission with at least one physical storage devices;

wherein the said external storage virtualization controller will automatically take

25   over the functionality originally performed by the alternate external storage virtualization controller in the said redundant storage virtualization controller pair when said alternate external storage virtualization controller is not on line or goes off line after being on line; and

25

wherein said SVC includes a state-defining circuit for forcing externally connected signal lines of alternate SVC in said redundant SVC pair to a predetermined state.

257. (new)   The storage virtualization controller of claim 256 wherein the a said at
5   least one device-side IO device interconnect port comprises a Serial ATA interconnect port for connecting to a said physical storage device through a Serial ATA IO device interconnect.

258. (new) An external storage virtualization controller for use in a redundant storage
10   virtualization controller pair, comprising:
        a central processing circuitry for performing IO operations in response to IO requests of a host entity;
        at least one IO device interconnect controller coupled to said central processing circuitry;
15   at least one host-side IO device interconnect port provided in a said at least one IO device interconnect controller for coupling to said host entity; and
        at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller for performing point-to-point serial signal transmission with at least one physical storage devices;
20   wherein the said external storage virtualization controller will automatically take over the functionality originally performed by the alternate external storage virtualization controller in the said redundant storage virtualization controller pair when said alternate external storage virtualization controller is not on line or goes off line after being on line; and
25   wherein said SVC includes a self-killing circuit for forcing its own externally connected signal lines to a predetermined state.

259. (new)   The storage virtualization controller of claim 258 wherein the a said at

26

least one device-side IO device interconnect port comprises a Serial ATA interconnect port for connecting to a said physical storage device through a Serial ATA IO device interconnect.

5   260. (new) An external storage virtualization controller for use in a redundant storage virtualization controller pair, comprising:

a central processing circuitry for performing IO operations in response to IO requests of a host entity;

at least one IO device interconnect controller coupled to said central processing

10   circuitry;

at least one host-side IO device interconnect port provided in a said at least one IO device interconnect controller for coupling to said host entity; and

at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller for performing point-to-point serial signal

15   transmission with at least one physical storage devices;

wherein the said external storage virtualization controller will automatically take over the functionality originally performed by the alternate external storage virtualization controller in the said redundant storage virtualization controller pair when said alternate external storage virtualization controller is not on line or goes

20   off line after being on line; and

wherein said functionality includes presenting and making available to the host entity accessible resources that were originally presented and made available by said alternate storage virtualization controller as well as accessible resources that were presented and made available by said storage virtualization controller itself.

25

261. (new)   The storage virtualization controller of claim 260 wherein the a said at least one device-side IO device interconnect port comprises a Serial ATA interconnect port for connecting to a said physical storage device through a Serial

27

ATA IO device interconnect.

262. (new) An external storage virtualization controller for use in a redundant storage virtualization controller pair, comprising:

5   a central processing circuitry for performing IO operations in response to IO requests of a host entity;

        at least one IO device interconnect controller coupled to said central processing circuitry;

        at least one host-side IO device interconnect port provided in a said at least one IO

10   device interconnect controller for coupling to said host entity; and

        at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller for performing point-to-point serial signal transmission with at least one physical storage devices;

        wherein the said external storage virtualization controller will automatically take

15   over the functionality originally performed by the alternate external storage virtualization controller in the said redundant storage virtualization controller pair when said alternate external storage virtualization controller is not on line or goes off line after being on line; and

        wherein an access ownership arbitration mechanism is provided to determine which

20   SVC in said SVC pair possesses access ownership.

263. (new)   The storage virtualization controller of claim 262 wherein the a said at least one device-side IO device interconnect port comprises a Serial ATA interconnect port for connecting to a said physical storage device through a Serial

25   ATA IO device interconnect.

264. (new) The storage virtualization controller of one of claims 262 and 263, wherein said access ownership arbitration mechanism includes an access ownership

28

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

detecting mechanism to determine if access ownership is possessed by said SVC.

265. (new) The storage virtualization controller of one of claims 262 and 263, wherein
said access ownership arbitration mechanism includes an access ownership
5   granting mechanism to grant access ownership when said access ownership is
requested by a said SVC.

266. (new) An external storage virtualization controller for use in a redundant storage
virtualization controller pair, comprising:
10   a central processing circuitry for performing IO operations in response to IO
requests of a host entity;
at least one IO device interconnect controller coupled to said central processing
circuitry;
at least one host-side IO device interconnect port provided in a said at least one IO
15   device interconnect controller for coupling to said host entity; and
at least one device-side IO device interconnect port provided in a said at least one
IO device interconnect controller for performing point-to-point serial signal
transmission with at least one physical storage devices;
wherein the said external storage virtualization controller will automatically take
20   over the functionality originally performed by the alternate external storage
virtualization controller in the said redundant storage virtualization controller pair
when said alternate external storage virtualization controller is not on line or goes
off line after being on line; and
further comprising a cooperating mechanism for the redundant SVC pair to
25   cooperatively control a patching state of an access control switch together with
the alternate SVC; a monitoring mechanism for said SVC of said SVC pair to
monitor status of the alternate SVC of said SVC pair; and, a state control
mechanism for said SVC to forcibly take complete control of said access control

29

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

switch independent of the state the alternate SVC of said SVC pair.

267. (new)   The storage virtualization controller of claim 266 wherein the a said at
              least one device-side IO device interconnect port comprises a Serial ATA
5   interconnect port for connecting to a said physical storage device through a Serial
              ATA IO device interconnect.

268. (new) An external storage virtualization controller for use in a redundant storage
           virtualization controller pair, comprising:
10   a central processing circuitry for performing IO operations in response to IO
              requests of a host entity;
           at least one IO device interconnect controller coupled to said central processing
              circuitry;
           at least one host-side IO device interconnect port provided in a said at least one IO
15   device interconnect controller for coupling to said host entity; and
           at least one device-side IO device interconnect port provided in a said at least one
              IO device interconnect controller for performing point-to-point serial signal
              transmission with at least one physical storage devices;
           wherein the said external storage virtualization controller will automatically take
20   over the functionality originally performed by the alternate external storage
              virtualization controller in the said redundant storage virtualization controller pair
              when said alternate external storage virtualization controller is not on line or goes
              off line after being on line; and
           wherein an inter-controller communication port is provided for communicating state
25   synchronization information between the said SVC and the alternate SVC in said
              redundant SVC pair.

269. (new)   The storage virtualization controller of claim 268 wherein the a said at

30

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

least one device-side IO device interconnect port comprises a Serial ATA interconnect port for connecting to a said physical storage device through a Serial ATA IO device interconnect.

5   270. (new) The storage virtualization controller of one of claims 268 and 269, wherein said inter-controller communication port is an existing IO device interconnect port, whereby inter-controller communication exchange is multiplexed with IO requests and associated data.

10   271. (new) The storage virtualization controller of one of claims 268 and 269, wherein said inter-controller communication port is a dedicated port the primary function thereof is to exchange said state synchronization information.

         272. (new) The storage virtualization controller of one of claims 268 and 269, wherein
15   said inter-controller communication port is Fibre Channel.

         273. (new) The storage virtualization controller of one of claims 268 and 269, wherein said inter-controller communication port is Serial ATA.

20   274. (new) The storage virtualization controller of one of claims 268 and 269, wherein said inter-controller communication port is Parallel SCSI.

         275. (new) The storage virtualization controller of one of claims 268 and 269, wherein said inter-controller communication port is Ethernet.
25
         276. (new) The storage virtualization controller of one of claims 268 and 269, wherein said inter-controller communication port is Serial-Attached SCSI (SAS).

31

277. (new) The storage virtualization controller of one of claims 268 and 269, wherein said inter-controller communication port is I2C.

278. (new) An external storage virtualization controller for use in a redundant storage
5   virtualization controller pair, comprising:
           a central processing circuitry for performing IO operations in response to IO
                requests of a host entity;
           at least one IO device interconnect controller coupled to said central processing
                circuitry;
10   at least one host-side IO device interconnect port provided in a said at least one IO
                device interconnect controller for coupling to said host entity; and
           at least one device-side IO device interconnect port provided in a said at least one
                IO device interconnect controller for performing point-to-point serial signal
                transmission with at least one physical storage devices;
15   wherein the said external storage virtualization controller will automatically take
                over the functionality originally performed by the alternate external storage
                virtualization controller in the said redundant storage virtualization controller pair
                when said alternate external storage virtualization controller is not on line or goes
                off line after being on line; and
20   wherein said SVC can perform IO request rerouting function.

279. (new)   The storage virtualization controller of claim 278 wherein the a said at
           least one device-side IO device interconnect port comprises a Serial ATA
           interconnect port for connecting to a said physical storage device through a Serial
25   ATA IO device interconnect.

280. (new) An external storage virtualization controller for use in a redundant storage
           virtualization controller pair, comprising:

32

a central processing circuitry for performing IO operations in response to IO
requests of a host entity;

at least one IO device interconnect controller coupled to said central processing
circuitry;

5   at least one host-side IO device interconnect port provided in a said at least one IO
device interconnect controller for coupling to said host entity; and

at least one device-side IO device interconnect port provided in a said at least one
IO device interconnect controller for performing point-to-point serial signal
transmission with at least one physical storage devices;

10   wherein the said external storage virtualization controller will automatically take
over the functionality originally performed by the alternate external storage
virtualization controller in the said redundant storage virtualization controller pair
when said alternate external storage virtualization controller is not on line or goes
off line after being on line; and

15   wherein said SVC can perform PSD access ownership transfer function.

281. (new)   The storage virtualization controller of claim 280 wherein the a said at
least one device-side IO device interconnect port comprises a Serial ATA
interconnect port for connecting to a said physical storage device through a Serial
20   ATA IO device interconnect.

282. (new) An external storage virtualization controller for use in a redundant storage
virtualization controller pair, comprising:

a central processing circuitry for performing IO operations in response to IO
25   requests of a host entity;

at least one IO device interconnect controller coupled to said central processing
circuitry;

at least one host-side IO device interconnect port provided in a said at least one IO

33

device interconnect controller for coupling to said host entity; and

at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller for performing point-to-point serial signal transmission with at least one physical storage devices;

5   wherein the said external storage virtualization controller will automatically take over the functionality originally performed by the alternate external storage virtualization controller in the said redundant storage virtualization controller pair when said alternate external storage virtualization controller is not on line or goes off line after being on line; and

10   wherein said SVC includes an expansion port for coupling to a second set of at least one PSD through multiple-device device-side IO device interconnects.

283. (new)   The storage virtualization controller of claim 282 wherein the a said at least one device-side IO device interconnect port comprises a Serial ATA
15   interconnect port for connecting to a said physical storage device through a Serial ATA IO device interconnect.

284. (new) An external storage virtualization controller for use in a redundant storage virtualization controller pair, comprising:

20   a central processing circuitry for performing IO operations in response to IO requests of a host entity;

at least one IO device interconnect controller coupled to said central processing circuitry;

at least one host-side IO device interconnect port provided in a said at least one IO
25   device interconnect controller for coupling to said host entity; and

at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller for performing point-to-point serial signal transmission with at least one physical storage devices;

34

wherein the said external storage virtualization controller will automatically take over the functionality originally performed by the alternate external storage virtualization controller in the said redundant storage virtualization controller pair when said alternate external storage virtualization controller is not on line or goes

5   off line after being on line; and

wherein at least one said host-side IO device interconnect port is Fibre Channel supporting point-to-point connectivity in target mode.

285. (new)   The storage virtualization controller of claim 284 wherein the a said at

10 .   least one device-side IO device interconnect port comprises a Serial ATA interconnect port for connecting to a said physical storage device through a Serial ATA IO device interconnect.

286. (new) An external storage virtualization controller for use in a redundant storage

15   virtualization controller pair, comprising:

a central processing circuitry for performing IO operations in response to IO requests of a host entity;

at least one IO device interconnect controller coupled to said central processing circuitry;

20   at least one host-side IO device interconnect port provided in a said at least one IO device interconnect controller for coupling to said host entity; and

at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller for performing point-to-point serial signal transmission with at least one physical storage devices;

25   wherein the said external storage virtualization controller will automatically take over the functionality originally performed by the alternate external storage virtualization controller in the said redundant storage virtualization controller pair when said alternate external storage virtualization controller is not on line or goes

35

off line after being on line; and

wherein at least one said host-side IO device interconnect port is Fibre Channel supporting public loop connectivity in target mode.

5   287. (new)   The storage virtualization controller of claim 286 wherein the a said at least one device-side IO device interconnect port comprises a Serial ATA interconnect port for connecting to a said physical storage device through a Serial ATA IO device interconnect.

10   288. (new) An external storage virtualization controller for use in a redundant storage virtualization controller pair, comprising:

a central processing circuitry for performing IO operations in response to IO requests of a host entity;

at least one IO device interconnect controller coupled to said central processing

15   circuitry;

at least one host-side IO device interconnect port provided in a said at least one IO device interconnect controller for coupling to said host entity; and

at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller for performing point-to-point serial signal

20   transmission with at least one physical storage devices;

wherein the said external storage virtualization controller will automatically take over the functionality originally performed by the alternate external storage virtualization controller in the said redundant storage virtualization controller pair when said alternate external storage virtualization controller is not on line or goes

25   off line after being on line; and

wherein at least one said host-side IO device interconnect port is Fibre Channel supporting private loop connectivity in target mode.

36

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

289. (new)   The storage virtualization controller of claim 288 wherein the a said at
least one device-side IO device interconnect port comprises a Serial ATA
interconnect port for connecting to a said physical storage device through a Serial
ATA IO device interconnect.

5

290. (new) An external storage virtualization controller for use in a redundant storage
virtualization controller pair, comprising:
a central processing circuitry for performing IO operations in response to IO
requests of a host entity;
10   at least one IO device interconnect controller coupled to said central processing
circuitry;
at least one host-side IO device interconnect port provided in a said at least one IO
device interconnect controller for coupling to said host entity; and
at least one device-side IO device interconnect port provided in a said at least one
15   IO device interconnect controller for performing point-to-point serial signal
transmission with at least one physical storage devices;
wherein the said external storage virtualization controller will automatically take
over the functionality originally performed by the alternate external storage
virtualization controller in the said redundant storage virtualization controller pair
20   when said alternate external storage virtualization controller is not on line or goes
off line after being on line; and
wherein at least one said host-side IO device interconnect port is parallel SCSI
operating in target mode.

25   291. (new)   The storage virtualization controller of claim 290 wherein the a said at
least one device-side IO device interconnect port comprises a Serial ATA
interconnect port for connecting to a said physical storage device through a Serial
ATA IO device interconnect.

37

292. (new) An external storage virtualization controller for use in a redundant storage
virtualization controller pair, comprising:

a central processing circuitry for performing IO operations in response to IO

5   requests of a host entity;

at least one IO device interconnect controller coupled to said central processing
circuitry;

at least one host-side IO device interconnect port provided in a said at least one IO
device interconnect controller for coupling to said host entity; and

10   at least one device-side IO device interconnect port provided in a said at least one
IO device interconnect controller for performing point-to-point serial signal
transmission with at least one physical storage devices;

wherein the said external storage virtualization controller will automatically take
over the functionality originally performed by the alternate external storage

15   virtualization controller in the said redundant storage virtualization controller pair
when said alternate external storage virtualization controller is not on line or goes
off line after being on line; and

wherein at least one said host-side IO device interconnect port is ethernet supporting
the iSCSI protocol operating in target mode.

20

293. (new)   The storage virtualization controller of claim 292 wherein the a said at
least one device-side IO device interconnect port comprises a Serial ATA
interconnect port for connecting to a said physical storage device through a Serial
ATA IO device interconnect.

25

294. (new) An external storage virtualization controller for use in a redundant storage
virtualization controller pair, comprising:

a central processing circuitry for performing IO operations in response to IO

38

Appl. No. 10/708,242
Amdt. dated January 23, 2007
Reply to Office action of January 05, 2007

requests of a host entity;

at least one IO device interconnect controller coupled to said central processing circuitry;

at least one host-side IO device interconnect port provided in a said at least one IO
5   device interconnect controller for coupling to said host entity; and

at least one device-side IO device interconnect port provided in a said at least one IO device interconnect controller for performing point-to-point serial signal transmission with at least one physical storage devices;

wherein the said external storage virtualization controller will automatically take
10   over the functionality originally performed by the alternate external storage virtualization controller in the said redundant storage virtualization controller pair when said alternate external storage virtualization controller is not on line or goes off line after being on line; and

wherein at least one said host-side IO device interconnect port is Serial-Attached
15   SCSI (SAS) operating in target mode.

295. (new)   The storage virtualization controller of claim 294 wherein the a said at least one device-side IO device interconnect port comprises a Serial ATA interconnect port for connecting to a said physical storage device through a Serial
20   ATA IO device interconnect.

296. (new) An external storage virtualization controller for use in a redundant storage virtualization controller pair, comprising:

a central processing circuitry for performing IO operations in response to IO
25   requests of a host entity;

at least one IO device interconnect controller coupled to said central processing circuitry;

at least one host-side IO device interconnect port provided in a said at least one IO

39

      device interconnect controller for coupling to said host entity; and

  at least one device-side IO device interconnect port provided in a said at least one
IO device interconnect controller for performing point-to-point serial signal
transmission with at least one physical storage devices;

5   wherein the said external storage virtualization controller will automatically take
over the functionality originally performed by the alternate external storage
virtualization controller in the said redundant storage virtualization controller pair
when said alternate external storage virtualization controller is not on line or goes
off line after being on line; and

10   wherein at least one said host-side IO device interconnect port is Serial ATA
operating in target mode.

297. (new)   The storage virtualization controller of claim 296 wherein the a said at
least one device-side IO device interconnect port comprises a Serial ATA
15   interconnect port for connecting to a said physical storage device through a Serial
ATA IO device interconnect.

40